CLAIMS

What is claimed is:

1. A method of producing an undrawn yarn having a predetermined crystallinity, comprising:

extruding a molten polymer through a spinneret plate to form a plurality of filaments; and

passing the plurality of filaments through a heated sleeve to thereby provide a quench delay, and taking up the plurality of filaments at a take-up speed;

wherein the quench delay and the take-up speed are selected such that an ultimate elongation of the undrawn yarn increases at the predetermined crystallinity when the quench delay increases.

2. The method of claim 1 wherein the predetermined crystallinity is between 10% and 40%, and wherein the undrawn yarn has a linear density of at least 300 dtex.

3. The method of claim 2 wherein the polymer comprises poly(ethylene terephthalate).

4. The method of claim 1 wherein the quench delay in the heated sleeve is increased by increasing a length of the heated sleeve.

5. The method of claim 1 wherein the length of the sleeve is at least 300 mm.

6. The method of claim 1 wherein the quench delay in the heated sleeve is increased by increasing a temperature in the heated sleeve.

7. The method of claim 1 wherein the take-up speed for the plurality of filaments is at least 3000 m/min.

8. A method of producing an undrawn yarn, comprising extruding a molten polymer through a spinneret plate to form a plurality of filaments, delaying quenching of the plurality of filaments in a heated sleeve, and taking up the plurality of filaments at a take-up speed TU (m/min) using a quench delay such that the crystallinity of the undrawn yarn is less than 0.017 x TU - 39.

9. The method of claim 8 wherein the polymer comprises a polyester, and wherein the yarn has a linear density of at least 300 dtex.

10. The method of claim 8 wherein the heated sleeve has a length of at least 300 mm and wherein a temperature in the heated sleeve is at least 250 °C.

11. The method of claim 8 wherein the take-up speed is between 3000 m/min and 5000 m/min.

12. The method of claim 8 further comprising drawing the plurality of filaments after taking up to form a drawn yarn.

13. The method of claim 12 further comprising providing an overfinish to the drawn yarn.

14. The method of claim 13 further comprising at least partially enclosing the overfinished drawn yarn in a rubber-containing composition.

15. An undrawn delayed-quenched dimensionally stable polyester yarn having a crystallinity C, and an ultimate elongation UE, wherein $UE \geq -1.6*C + 121$.

16. The undrawn dimensionally stable polyester yarn of claim 15 wherein the polyester comprises poly(ethylene terephthalate).

17. The undrawn yarn of claim 15 wherein the crystallinity is between 10% and 40%.

18. The undrawn yarn of claim 17 wherein the linear density is between 300 and 6000 dtex.

19. A drawn dimensionally stable yarn formed from the undrawn dimensionally stable polyester yarn of claim 15.

20. A product comprising the drawn dimensionally stable yarn of claim 19.

21. The product of claim 20, wherein the product is selected from the group consisting of a power transmission belt, a conveyor belt, an automobile tire, a safety belt, a parachute harnesses, a parachute line, a cargo handling net, and a safety net.

22. An apparatus comprising:

a spinneret plate operationally coupled to an extruder, that provides a molten polymer to the spinneret plate, wherein the spinneret plate produces a plurality of filaments from the molten polymer;

a heated sleeve that receives the plurality of filaments, thereby delaying quenching at a predetermined quench delay; and

a take-up roll that takes up the plurality of filaments at a take-up speed, wherein the take-up speed and the heated sleeve are configured to operate at a condition in which ultimate elongation of a yarn having a predetermined crystallinity increases when the predetermined quench delay increases.

23. The apparatus of claim 22 wherein the molten polymer comprises a polyester and wherein the spinneret plate comprises at least 50 orifices that produce the plurality of filaments.

24. The apparatus of claim 22 wherein the heated sleeve has a length of at least 300 mm and wherein the heated sleeve has a temperature of at least 250 °C.

25. The apparatus of claim 22 wherein the take-up speed is between 3000 m/min and 5000 m/min.